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<u>Preliminary - Not to be Quoted</u>

Social Science Research Council

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Committee on the Economy of China

LABOR PRODUCTIVITY IN INDUSTRY DURING THE FIRST FIVE-YEAR PLAN

25X1

Conference on Economic Trends in Communist China

October 21-24, 1965

25 YEAR RE-REVIEW

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LABOR PRODUCTIVITY IN INDUSTRY DURING THE FIRST FIVE-YEAR PLAN

The Chinese Communists have claimed that the productivity of labor increased by 61 percent during the First Five-Year Plan (1953-1957). Because the productivity of labor is an important measure of economic performance, this paper attempts to evaluate this claim and thus to determine how successful the Chinese have been in their self-imposed task of raising the productivity of labor in industry.

A summary of the paper follows. First, the rationality of the Chinese Communist emphasis on raising the productivity of labor is discussed. For a country with a relatively scarce supply of capital but an abundant supply of labor, like China, it would appear to be more rational to stress the importance of the productivity of capital. It is concluded, however, that the emphasis on the productivity of labor is rational, at least in the short run, because it reduces the labor cost of output, but that the emphasis may have been a contributing factor in the concentration of scarce capital resources in a few capital-intensive production processes to the detriment of the general growth of industry.

Second, the limitations of the official Chinese Communist productivity statistics are discussed. Although these statistics are shown to be consistent with other published data, it is concluded that the official statistics are not an adequate measure of the

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growth of productivity because of defects in the data on the gross value of industrial production used in the productivity calculations.

Third, an independently constructed measure of the growth of productivity is presented. This measure, which is derived from an index of value-added based directly on physical output data and an index of labor derived from official data, shows that the value-added per worker in Chinese industry grew 40.3 percent during the First Five-Year Plan (1953-1957), but that the differences from year to year and by branch of industry were extreme. On the average, the increase in productivity accounted for 45.6 percent of the increase in output, while the growth of labor inputs accounted for the remaining 54.4 percent. Finally, it is shown that the shift in the structure of value-added toward heavy industry had a negligible effect on the growth of productivity.

Fourth, some of the factors contributing to the growth of productivity are examined. Data on the aggregate net value of capital and on the aggregate consumption of energy are presented, and it is shown that the substantial increases in the productivity of labor during the First Five-Year Plan were accompanied by a steadily rising capital-labor ratio and by decreases in the productivity of capital. For the individual branches of industry, the average annual rates of growth of output per worker are compared

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both with the rates of growth in the value of assets per worker and with the rates of growth in the consumption of electric power per worker. These comparisons show that the rates of growth in the value of assets per worker and in the consumption of electric power per worker were consistent with the growth of labor productivity. It is tentatively concluded that capacity was not fully utilized in 1952 and that the more intensive use of this capacity was also an important factor in the growth of productivity during the First Five-Year Plan.

Although productivity almost certainly declined during the "leap forward" (1958-1960) and has by now probably recovered to a level equal to or slightly above that of 1957, I have been unable to measure the changes in productivity since 1957 because the necessary data are not available. It is obvious that the numerator and the denominator of a productivity ratio must refer to the same universe and that the universe must remain constant over time for a measure of the trend in productivity to have any meaning. In 1958, however, the Chinese Communists changed the universe for which industrial statistics are reported to include the employment and output of almost all handicraft cooperatives and all rural commune industries, but official statistics have not been reported in sufficient detail to permit the estimation of data comparable to that published for the First Five-Year Plan.

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I. The Chinese Communist Interest in Productivity

Chinese Communist economists and statisticians are just as interested in raising the productivity of labor as their comrades in the Soviet Union, and quotations from Lenin such as the following appear as often in Chinese as in Soviet journals:

> In the last analysis, productivity of labour is the most important, the principal thing for the victory of the new social system. Capitalism created a productivity of labour unknown under serfdom. Capitalism can be utterly vanquished, and will be utterly vanquished, by the fact that Socialism creates a new and much higher productivity of labour.*

For a country with a relatively scarce supply of capital but an abundance of labor, like China, it would be more rational to stress the importance of raising the productivity of capital. Why, then, do the Chinese stress the productivity of labor? Perhaps the explanation lies in the ideological importance to them of the labor theory of value, or perhaps in the relative ease with which labor productivity can be measured. The more significant question, however, is not what explains the emphasis but whether the emphasis is rational.

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* V.I. Lenin, A Great Beginning, Moscow, 1951, p. 32 (translated from Izlrannyye proizvedeniya, vol. 29, p. 394). Chinese writers cite Lieh-ning ch'üan-chi (Complete Works of Lenin), Peiping, Vol. 29, p. 388.

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To determine the rationality of the Chinese emphasis on productivity of labor, let us consider a simplified model of Chinese industry in which only one commodity is produced with two factors of production, labor and capital. These factors of production can be used in various combinations to produce the amounts of output shown by the field of isoquants in the upper half of Figure 1. The amount of labor employed is easily varied, but the supply of capital is fixed at K, at least in the short run. The lower half of the figure shows the short-run production function, OAB. Because capital is fixed, changes in production are a function of changes in labor alone. Given K, the function shows the maximum amount which can be produced with any given quantity of labor, or conversely, the minimum amount of labor necessary to produce any given output. In the lower half of the figure, the average productivity of labor is measured by the slope of the line running from the origin through the point on the production function which shows the amount of output that can be produced with a given amount of labor.

If the emphasis on raising the productivity of labor in industry means attempting to maximize productivity, the Chinese would choose to produce at point A, where output and employment are Q' and L', respectively. Because the slope of the line running from the origin through point A is steeper than the slope of any other line drawn from

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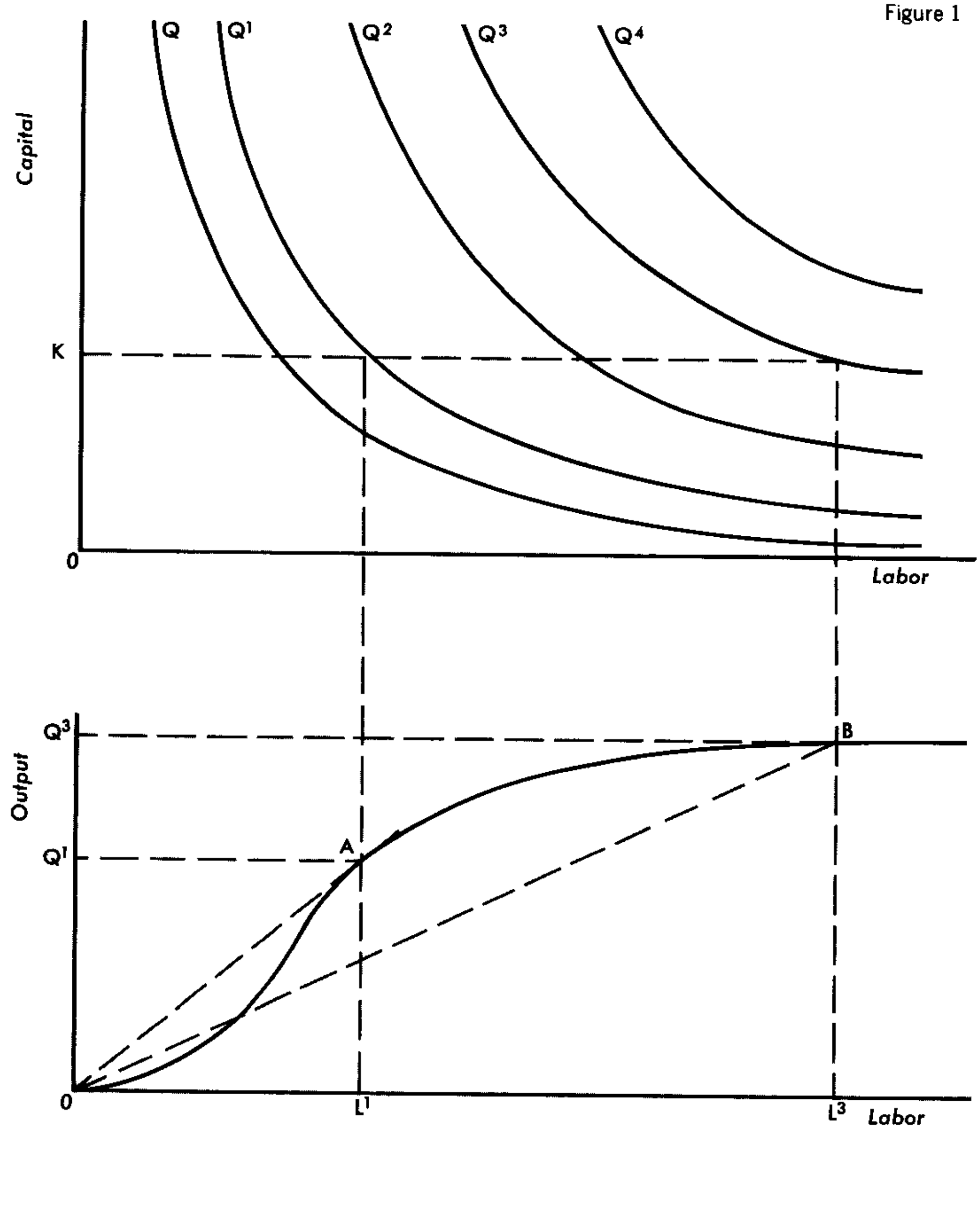
Figure 1



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the origin through a point on the production function, the productivity of labor at point A is the maximum level attainable in the short run. But as has been noted, capital is scarce in relation to labor. With an abundant supply of labor, the Chinese could produce at point B. Although increasing employment to L''' would reduce the productivity of labor, producing at point B would maximize the productivity of capital because it raises output to Q''', the highest level that can be achieved with a fixed supply of capital equal to K. Producing at point A must be considered irrational because it does not make the best use of the scarce supply of capital; and the Chinese emphasis on raising the productivity of labor, if it meant maximizing productivity, would also have to be considered irrational.

The emphasis, however, does not mean that the Chinese are attempting to maximize productivity, because raising productivity is only a secondary goal. The primary goal is to fulfill planned increases in production. What the Chinese hope to accomplish by raising productivity is to maximize productivity under the constraint of achieving the planned level of production, or to avoid waste by using the least possible input of labor to achieve the given output.

But is the attempt to raise the productivity of labor rational, even as a secondary goal? To answer this question, let us consider the nature of the planning process. If the members of the planning

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commission were drafting an annual plan for our simplified two-factor model of Chinese industry, they would know that industry was operating at the level shown by point P_1 in Figure 2, and they would know that current output and employment were Q_1 and L_1, respectively. However, they would not be able to calculate the optimum level of employment for the given level of output, because neither the location of the isoquants nor the shape of the short-run production function are known, but there would be no reason for them to assume that industry was operating as efficiently as possible. They might believe, therefore, that industry could achieve a level of output of Q_2 during the following year, and they might plan to achieve this output with employment L_2 -- a less than proportional increase. Achieving the planned increase in output with a less than proportional increase in employment means that the planned incremental output-labor ratio, shown by the slope of the line from P_1 to P_2, is greater than the current output-labor ratio, shown by the slope of the line running from the origin through point P_1. Because keeping the incremental output-labor ratio greater than the current output-labor ratio forces the economy in the direction of the optimum level of employment, the emphasis which the Chinese place on the productivity of labor must be considered rational at least in the short run.

It is not the short-run effort to reduce labor cost by avoiding waste, however, that is important but the impact which the emphasis on

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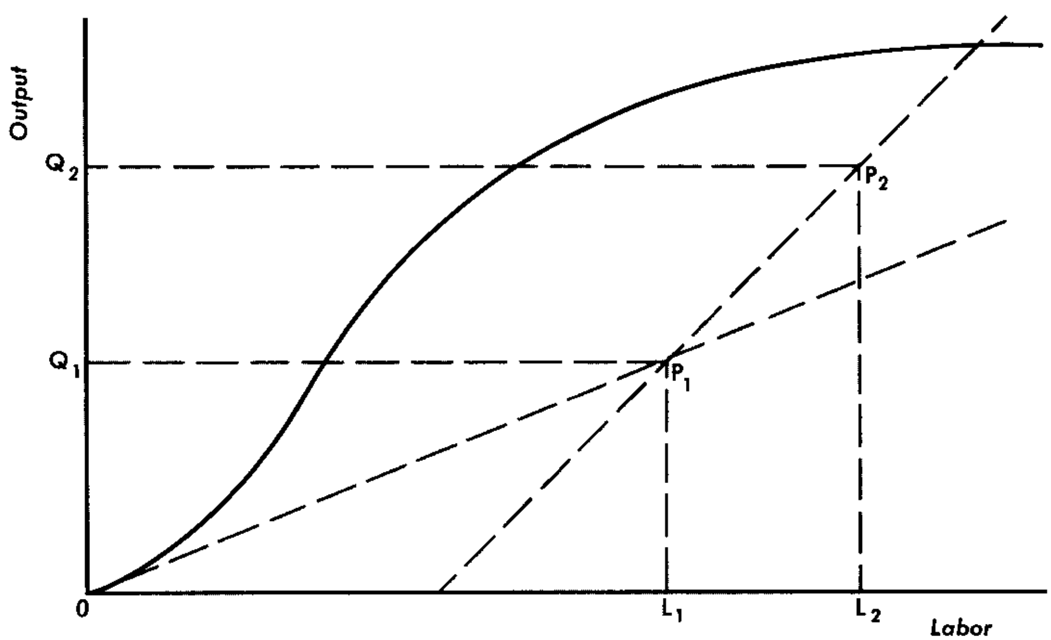
Figure 2



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raising the productivity of labor may have had on the allocation of capital in different uses. The pattern of investment laid down in the First Five-Year Plan and followed during the years 1953-1957, for example, called for the concentration of scarce capital resources in a small number of capital-intensive industries. Although there is no suggestion in Chinese Communist literature that doctrinal concern with raising the productivity of labor was important in shaping decisions on the pattern of investment, this concentration in capital-intensive industries has raised the level of productivity in those industries but probably retarded the rate of growth in industry as a whole.

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II. The Limitations of Chinese Communist Productivity Statistics

Chinese Communist economists and statisticians are just as interested in productivity as their comrades in the Soviet Union, but productivity statistics are handled with much less sophistication. Consider, for example, the official handbook on labor statistics which presents formulas for and discusses various methods of measuring the productivity of labor.* In the section of the handbook which discusses measures of productivity based on labor norms, the following formula is given:

$$\frac{\Sigma q_1 t_{no}}{\Sigma q_1 t_1} \Big/ \frac{\Sigma q_1 t_{no}}{\Sigma q_1 t_0}$$

where q_1 and q_0 represent output in the given and base years, respectively, t_1 and t_0 represent actual labor expended per unit of output in the given and base years, respectively, and t_{no} represents a fixed labor norm per unit of output. Productivity in the given year is expressed as the ratio of the normal expenditure of labor $\Sigma q_1 t_{no}$ to the actual expenditure $\Sigma q_1 t_1$, but when the given year is compared with the base year the norms cancel out and the formula is reduced to: $\Sigma q_1 t_0 \,/\, \Sigma q_1 t_1$

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* Statistical Work Handbook Editorial Committee, Lao-tung t'ung-chi kung-tso shou-ts'e (Labor Statistical Work Handbook), Peiping, 1958, pp. 41-52. A notice on the compilation of a series of handbooks on statistical work appeared in T'ung-chi kung-tso (Statistical Work), No. 12, 1956, p. 23. This notice states that the State Statistical Bureau was compiling the handbooks, but most of them were published in the name of the Committee.

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This formula for the productivity of labor appears to be the reciprocal of and, therefore, the same as the measure that Strumilin, the dean of Soviet economists, considered to be the only theoretically valid index of labor consumption. Strumilin's index may be represented as follows:

$$\Sigma q_x l_1 \Big/ \Sigma q_x l_0$$

where q_x represents a fixed bundle of commodities and l_1 and l_0 represent unit labor requirements in the given and base years, respectively.* Because the Chinese version of the index uses given year weights, the Chinese formula is only equivalent to that of Strumilin when comparing a given year with the base year. If the index numbers for any two years are compared at random, such as those for years 1 and 2, the comparison may be represented as:

$$\frac{\Sigma q_2 t_0}{\Sigma q_2 t_2} \Big/ \frac{\Sigma q_1 t_0}{\Sigma q_1 t_1}$$

When two years are compared at random, the Chinese formula does not employ a fixed bundle of commodities, but the use of a fixed bundle of commodities is precisely what Strumilin felt gave his measure its theoretical validity.

This one example is sufficient to show the lack of sophistication on the part of the Chinese in handling index numbers, but how

* See Walter Galenson, Labor Productivity in Soviet and American Industry, New York, 1955, p. 11.

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sophisticated are the actual statistics on the productivity of labor released by the regime? Table 1 presents the Chinese statistics, both in absolute terms and as index numbers. The table shows that the Chinese claim that productivity increased 61 percent in five years, but can this claim be accepted? Because of the difficulties that Western scholars have experienced in trying to reconstruct Soviet productivity data* and because of the confusing array of not clearly identified and seemingly contradictory data that have been published in China,**

* An index of Soviet productivity calculated from the official index of industrial production and the official index of employment grows significantly more slowly than the official index of productivity. The reason for the discrepancy appears to be the linking of separate indices which are not comparable in coverage. See Gertrude Schroeder, "Soviet Industrial Labor Productivity," Joint Economic Committee of the U.S. Congress, Dimensions of Soviet Economic Power, Washington, 1962, pp. 137-162.

** Consider, for example, the following tabulation from Yuan Fang, "The Ratio of Increase Between Labor Productivity and Wages," Hsin chien-she (New Construction), No. 12, 1956:

	Labor Productivity (percentage increase)
1953	13
1954	15
1955	10

Then compare the data with the following quotations from the annual communiqués of the State Statistical Bureau:

> Productivity of workers in the state-owned and joint state and privately owned large-scale industrial enterprises (comparable section) in 1953 increased by 13 percent over 1952 (State

Footnote continued on following page.

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Table 1

Official Data on the Gross Value of Output per Worker in Chinese Industry 1952-1957

	Value (1952 Yuan)	Index (1952 = 100)	Annual Percentage Change
1952	7,506	100	- - -
1953	8,546	114	14
1954	9,288	124	9
1955	10,274	137	11
1956	12,172	162	18
1957	12,085	161	-1

Sources: 1952-1956: Chung-kuo kung-jen (The Chinese Worker), No. 4, 1958, p. 7.

1957: Derived by multiplying the gross value of output per worker in 1952 by the 161 percent reported in Ma Wen-jui, "Ten Years Struggle to Promote the High Speed Development of Productivity and Improvement of Worker's Living Standards," Jen-min jih-pao (People's Daily), September 25, 1959.

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it must be demonstrated that the official series does, in fact, include all sectors of industry and that it is consistent with other published data.

The reported productivity series cannot be compared with a series computed independently from data on the gross value of industrial production and the average number of workers, because the number of workers has not been reported. It is possible, however, to derive the

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Statistical Bureau, Communique on National Economic Development and Fulfillment of the State Plan in 1953, September 12, 1954, reprinted in People's China, Supplement, November 16, 1954, p. 3)

In 1954 . . . the productivity of labor of workers in state-owned and joint state-private industrial enterprises rose approximately 15 percent compared with 1953 (State Statistical Bureau, Report on National Economic Development and Fulfillment of the State Plan in 1954, Peiping, 1956, p. 20)

In 1955, the productivity of labor of workers in state, cooperative, and joint state-private enterprises increased by 10 percent as compared with 1954 (State Statistical Bureau, Communiqué of National Economic Development and Fulfillment of the State Plan in 1955, July 16, 1956, reprinted in People's China, Supplement July 16, 1956, p. 7).

When the data are clearly identified, as they are in the quotations from the State Statistical Bureau communiqués, it is readily apparent that they are not comparable and should not have been presented as a single series as they were in the article cited above.

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number of workers from the gross value and productivity data and to compare the derived data on workers with the sum of the number of workers in the socialist and private sectors of industry. These derivations and the comparison of the results are presented in Table 2. It can be seen that the number of workers derived directly and the sum of the number derived for the socialist and private sectors do not differ by more than 0.7 percent in any year. It is clear, therefore, that the productivity series does in fact include all industry and that it is consistent with other published data.

Even though the coverage of the official series on productivity is complete and the series is consistent with other published data, it cannot be accepted as a valid measure of the trend in the productivity of labor, because productivity is measured as the gross value of output per worker, and gross value is known to be a defective measure of output. Briefly, the defects of the official gross value data are the sensitivity of the data to organizational changes, and the nature of the prices used.

The official gross value data are particularly sensitive to organizational changes because they are collected by the "factory reporting method." According to the factory reporting method, each enterprise reports the gross value of its production, and the total gross value of industrial production is simply the sum of the data

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Table 2

Alternative Estimates of the Average Number of Workers
in Chinese Industry
1952-1955

	Unit of Measure	1952	1953	1954	1955
Estimate I					
All industry					
Gross value a/	Million yuan	27,014	35,577	41,513	44,748
Productivity b/	Yuan per worker	7,506	8,546	9,288	10,274
Workers c/	Thousand persons	3,599	4,163	4,470	4,355
Estimate II					
Socialist sector					
Gross value a/	Million yuan	16,488	22,468	31,172	37,482
Productivity d/	Yuan per worker	8,049	9,016	10,372	11,387
Workers c/	Thousand persons	2,048	2,492	3,005	3,292
Private sector					
Gross value a/	Million yuan	10,526	13,109	10,341	7,266
Productivity e/	Yuan per worker	6,801	7,848	7,222	6,879
Workers c/	Thousand persons	1,548	1,670	1,432	1,056
All industry					
Workers f/	Thousand persons	3,596	4,162	4,437	4,348
Workers in estimate II as a percent of workers in estimate I		99.92	99.98	99.26	99.84

a. State Statistical Bureau, "Kuo-min ching-chi t'ung-chi t'i-yao" ("Statistical Abstract of the National Economy"), appended to the pamphlet <u>Kuan-yü 1956 nien-tu kuo-min ching-chi chi-hua chih-hsing chieh-kuo ti kung-pao</u> (<u>Communiqué on Results of Implementation of the 1956 Economic Plan</u>), released August 1, 1957, Peiping, no publication date, pp. 28-29.

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b. Chung-kuo kung-jen (The Chinese Worker), no. 4, 1958, p. 7.

c. Derived by dividing the gross value of output by the gross value of output per worker.

d. State Statistical Bureau, Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chin-hsi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries -- Past and Present), Peiping, 1958, p. 27.

e. T'ung-chi kung-tso Data Section, "The Development of State Capitalism in China's Industry," T'ung-chi kung-tso (Statistical Work), No. 20, 1956, p. 2.

f. Derived as the sum of the number of workersin the socialist and private sectors.

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reported by the separate enterprises. For example, if an enterprise produced one million tons of pig iron and 900 thousand tons of steel but consumed 800 thousand tons of the pig iron in refining the steel, the gross value of the production of the enterprise would be based on 900 thousand tons of steel and 200 thousand tons of pig iron.* The value reported, therefore, is neither gross value (price times quantity) nor net value (value added times quantity), but it may be best be described as the value of enterprise sales.

To explain the sensitivity of the official gross value data, let us consider the Chinese Communist system of recordkeeping as it would apply to the production of a commodity that passes through three stages of fabrication, each stage being performed by a different enterprise. Let M be the value of the materials consumed, and V_1, V_2, and V_3 be the value added in each successive stage. The gross value reported by each enterprise and the total gross value would be as follows:

	Gross Value
Enterprise 1	$M + V_1$
Enterprise 2	$M + V_1 + V_2$
Enterprise 3	$M + V_1 + V_2 + V_3$
Total	$3M + 3V_1 + 2V_2 + V_3$

* Fang Fa, "Tabulation Forms for Industrial Production Planning" Chi-hua ching-chi (Planned Economy), No. 1, 1957, pp. 26-31.

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If each stage of fabrication were carried out by a number of enterprises, horizontal mergers would not effect the reported gross value. The sole result would be a smaller number of enterprises reporting a larger value of production per enterprise. The effect of vertical integration, however, is quite different. If the enterprises performing the second and third stages of fabrication were integrated, the reported gross value would be as follows:

	Gross Value
Enterprise 1	$M + V_1$
Integrated Enterprises	$M + V_1 + V_2 + V_3$
Total	$2\,M + 2\,V_1 + V_2 + V_3$

The vertical integration of the enterprises would reduce the total reported gross value by $(M + V_1 + V_2)$.

But how does the factory reporting method work out in practice? In 1956, during the socialist transformation of private industry, the horizontal mergers of large numbers of fairly small enterprises reduced the gross value of their production by less than one percent. In the same year, however, when the definition of an "enterprise" for accounting purposes was shifted from the control bureau to the mine, the reduction in the degree of vertical integration of the coal industry increased the gross value of its output by 10 percent.* The official gross value data, therefore, are not affected significantly by horizontal mergers but are changed by vertical integration, and the change is inversely related to the change in the degree of vertical integration.

Between 1952 and 1956 the number of industrial enterprises was reduced from 167,000 to 60,000, of which only 40,000 were independent accounting units. Although most of this reduction in the number of enterprises represents horizontal mergers, the degree of vertical integration must have increased, and this increase must have introduced a downward bias into the official gross value data.

If organizational changes have introduced a downward bias, why does the gross value data have such a strong upward bias? Let us consider the nature of the prices used to value physical output. Physical output is value in constant 1952 prices, which are defined as the average of prices in use between July and September 1952, but two factors have caused these prices to overweight the faster growing commodities and impart a strong upward bias to the official gross value data.

* "Where do the Differences of Opinion Lie? A Discussion of Methodological Problems in Computing the Gross Value of Industrial Production," T'ung-chi kung-tso (Statistical Work), No. 24, 1956, p. 6.

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The first factor is that the official 1952 prices overstated the value of producer goods in relation to the value of consumer goods. The prices of industrial commodities were high in relation to those for agricultural commodities, and the prices for producer goods were high in relation to those for consumer goods.* Users of small machines, for example, preferred to make their own or to buy them from private enterprises rather than pay the official price to state enterprises.** Because the output of producer goods grew faster than the output of consumer goods, overpricing of producer goods gave an upward bias to the official data.

The second factor that has distorted the official prices was overpricing many of the new commodities which were produced for the first time during the years following 1952. The State Statistical Bureau has stated that new products are supposed to be priced at "test manufacturing" cost with some allowance for the expected decline in cost after production has become regularly established. The prices of the new products should then be converted from current to 1952 prices by the same factor used to convert the current price of some similar

* Ibid.

** Fan Jo-i, "More on the Price Policy for Heavy-Industry Products," Ching-chi yen-chiu (Economic Research), No. 3, 1957, p. 54.

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product on the constant price list. Because of the difficulty in estimating what the actual cost of production would be after the process had been put into operation, this procedure greatly overvalued most of the new products.* One specific example is that of a 6,000-kilowatt marine engine which was priced on the basis of a 1,320,000-yuan cost of production in 1955 but which actually cost 380,000 yuan to produce in 1956.** In fact, the actual situation was so bad that the prices of some of these new products were far above the actual cost of production even after being converted from current to 1952 prices. Because the production of these new items grew much faster than industrial output as a whole, overpricing them introduced another source of upward bias into the official index.

Thus it may be concluded not only that the Chinese Communists are naive in their statistical methods, but that the official figures cannot be taken to demonstrate what the Chinese Communist statisticians think they do.

* State Statistical Bureau, "Explanations of Certain Problems Arising from the Computations of 1957 Constant Prices for Industrial Products," T'ung-chi kung-tso (Statistical Work), No. 10, 1957, pp. 11-13.

** Fan Jo-i, op.cit., p. 66.

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III. A Value-Added Index of Industrial Productivity

Because of the defects in the official productivity data discussed in the previous section, an independently constructed index must be used to measure the growth of productivity. The index of productivity presented in this section is derived from an index of value-added based directly on physical output data and an index of labor derived from official data. The value added by industry in 1957 was 209.8 percent of the level of 1952. Labor, which grew by 49.5 percent between 1952 and 1957, contributed 54.4 percent of the growth in output, while productivity, which grew by 40.3 percent, contributed the remaining 45.6 percent of the growth in output, but the differences, from year to year and by branch of industry, were extreme. In general, those branches of industry producing industrial materials and machinery not only grew faster than those producing fuels and consumer goods but also had higher increases in productivity. Finally, the shift in the structure of value added toward heavy industry had a negligible effect on the growth of productivity.

The index of industrial production was constructed from Chinese data on the physical output of 32 commodities produced by nine branches

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of industry.* These data were weighted in two stages and then adjusted for coverage. In the first stage the output series were grouped by branch of industry. The indexes for five branches of industry -- electric power, coal, ferrous metals, building materials, and paper -- are based on a single commodity. For the electric power, coal, and paper industries, production is relatively homogeneous, and a single output series includes the entire production of the branch. For the ferrous metals industry, only the output series for the production of rolled steel was used. Although data were available for the production of iron and manganese ore, pig iron, and crude steel, these commodities were not included, because they are intermediate products which are almost entirely consumed within the industry. For the building

* The index of industrial production presented in this paper differs from the index presented in the previous paper in several respects. My index is based on nine branches of industry and is adjusted for coverage while Professor Chao's is based on 13 branches of industry and is not adjusted for coverage. The branches of industry included in Professor Chao's index but not included in mine are the petroleum, nonferrous metals, timber, and light industries. There are also certain differences within branches of industry. For example, I have adjusted the data on the production of electric power to exclude the power generated at industrial powerplants because the weight assigned to the electric power industry is based on the number of workers employed at public power stations. Or again, for the textile industry I have excluded series for the production of cotton yarn, wool yarn, and raw silk so that the output series included will represent as nearly as possible the final output of the textile industry. And finally the weight bases are different. We both used wage-bill weights, but Professor Chao's are for 1952 while mine are for 1956. I selected 1956 as the weight base for my index because I felt the quality of the data on average earnings was better for 1956 than for 1952.

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materials industry, the only commodity for which data were available is cement. The indexes for the remaining branches of industry -- metal processing, chemical processing, textiles, and food -- were based on a sample of the commodities produced by the branches weighted by their respective prices.

In the second stage an index for the nine specifically included branches of industry was obtained by aggregating the indexes for the individual branches. The weights employed for the aggregation of the branch indexes were estimates of the values added in 1956 that were computed from the wage bill paid to workers employed in industry. The wage bill was computed from data on average earnings and average employment. If data on the wage bill had been available in sufficient detail, the value added per unit of output could have been used directly as the weight for each commodity, but these data were available only for branches of industry, not for individual commodities. Finally, the index for the nine specifically included branches of industry was adjusted for coverage on the assumption that the proportion of the value added included in these nine branches was the same as the proportion of the gross value contributed by these branches.

The indexes of labor were derived from the average number of workers. For industry as a whole the number of wage workers was

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estimated by dividing the official gross value of output by the gross value of output per worker. For the individual branches of industry, the data were reported for the electric power, coal, ferrous metals, paper, and textile industries and could be derived from data on the consumption of electric power in the metal processing, chemical processing, and building material industries. The estimation of the number of workers employed in the food industry, however, was more complicated. The average number of workers in the food industry in 1956 was estimated on the assumption that the proportion of workers among all workers and employees was the same as that for all industry and on the assumption that the average number of workers and employees was the same as the number reported for the end of 1955. The average number of workers in the food industry in 1952 was estimated on the assumption that the number of workers in the food industry as a whole grew at the same rate as the number of workers in those enterprises for which data on the consumption of electric power are available.

The indexes of productivity which were derived from these indexes of output and labor are indexes of output per man-year. Conceptually, output per man-year is the product of output per man-hour and the average number of hours worked per person per year. That is:

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$$\frac{Q}{L} = \frac{Q}{H} \times \frac{H}{L}$$

where Q represents the quantity of output, L represents the average number of workers, and H represents the total number of man-hours worked per year. Thus the movement of an index of output per man-year is the result of changes in the average number of hours worked per year as well as the result of changes in hourly productivity, but specific data which would permit the isolation of the change due to each of these factors are not available. Because of the physical limitation in the number of hours which can be worked per year, however, it is obvious that long-run increases in output per man-year must come from increases in output per man-hour. In actual fact, the number of hours worked per year was high in 1952 and remained high throughout the period. The effect of the variation in the number of hours worked per year, therefore, is minor except for year to year fluctuations.

The indexes of output, labor, and productivity are presented in Table 3 and Figure 3. Between 1952 and 1957, output more than doubled while labor increased by 49.5 percent and productivity by 40.3 percent. A gain in productivity of more than 40 percent in a five year period is impressive, but the gains from year to year were uneven. In 1953, output increased by 20.7 percent over the level of

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Table 3

Indexes of Output, Labor, and Productivity
in Chinese Industry
1952-1957

	1952	1953	1954	1955	1956	1957
Output						
Index (1952 = 100) a/	100.0	120.7	138.5	146.2	190.4	209.8
Annual percentage change	---	20.7	14.8	5.5	30.2	10.2
Labor						
Index (1952 = 100) b/	100.0	115.7	124.2	121.0	133.9	149.5
Annual percentage change	---	15.7	7.3	-2.6	10.7	11.6
Productivity						
Index (1952 = 100) c/	100.0	104.3	111.5	120.8	142.2	140.3
Annual percentage change	---	4.3	6.9	8.3	17.7	-1.3

a. Table A-1.

b. Derived from the number of wage workers in industry. The number of wage workers was estimated by dividing the gross value of output by the gross value of output per worker. The gross value of output is reported in State Statistical Bureau "Kuo-min ching-chi t'ung-chi t'i-yao" ("Statistical Abstract of the National Economy"), appended to the pamphlet Kuan-yü 1956 nien-tu kuo-min ching-chi chi-hua chih-hsing chieh-kuo ti kung-pao (Communiqué on Results of Implementation of the 1956 Economic Plan), released August 1, 1957, Peiping, no publication date, pp. 28-29, and in State Statistical Bureau, Ten Great Years, Peiping, 1960, p. 16. The gross value of output per worker is from Table 1.

c. Derived by dividing the index of output by the index of labor.

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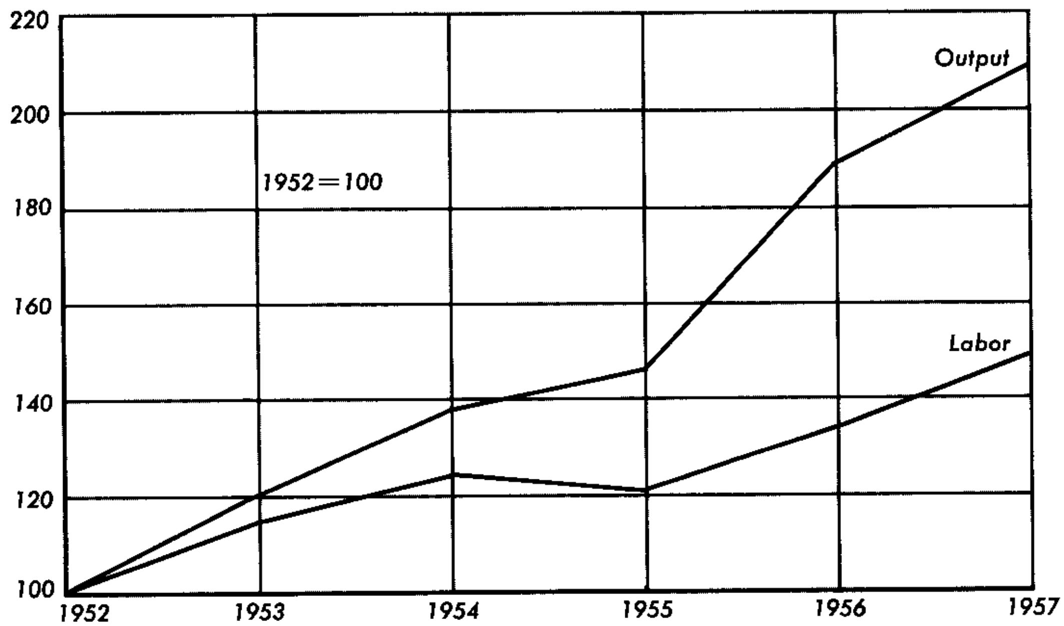
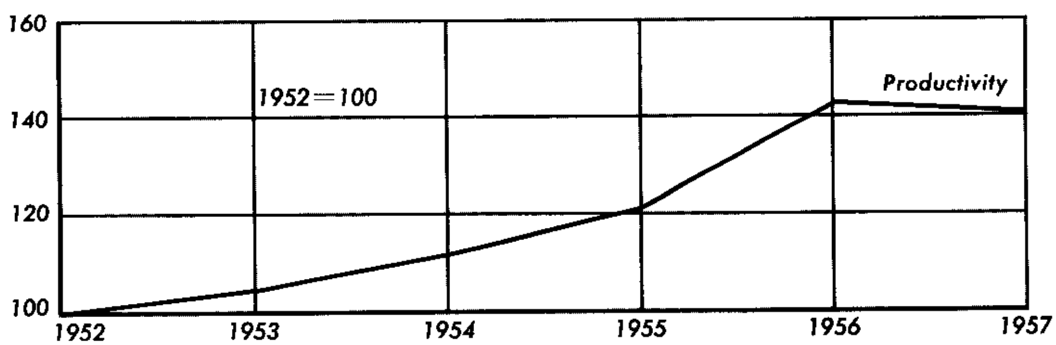
Figure 3

INDEXES OF OUTPUT, LABOR, AND PRODUCTIVITY IN CHINESE INDUSTRY 1952-1957





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1952, but because of the large increase in the average number of workers, productivity increased by only 4.3 percent. This large increase in the average number of workers was a continuation of the large increases that occurred annually during the period of economic reconstruction from 1949 to 1952. In 1954 and 1955 the increases in output declined to 14.8 percent and 5.5 percent, respectively, but productivity increased in both years because of the decline in employment in the private sector and the tight control over hiring in the socialist sector. The number of workers increased by 7.3 percent in 1954 and actually declined by 2.6 percent in 1955. In 1956, productivity increased by 17.7 percent, despite a 10.7-percent increase in the number of workers, because of the growth of 30.2 percent in output. In 1957, another large increase occurred in the number of workers, but productivity declined slightly because output grew by only 10.2 percent.

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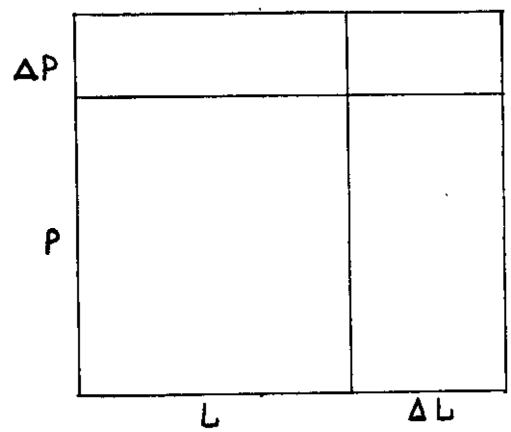
The data in Table 3 show that output increased by 109.8 percent between 1952 and 1957, but how much of this increase can be attributed to the growth of productivity? One way in which this question has been answered is first to calculate the amount by which output would have increased if productivity had remained constant, and then to attribute all the rest of the growth in output to the growth of productivity.* With no increase in productivity, the increase in output would have been the same as the increase in labor, or 49.5 percent. The portion of the increase due to the increase in labor, therefore, would be 49.5 ÷ 109.8 = 45.1 percent and that portion due to the increase in productivity would be 100.0 - 45.1 = 54.9 percent.

But suppose the question had been answered by calculating the amount by which output would have increased if labor had remained constant? With no increase in labor, the increase in output would have been the same as the increase in productivity, or 40.3 percent, and the increase in output due to the increase in productivity would be 40.3 ÷ 109.8 = 36.7 percent.

* This is the current practice in China and the Soviet Union. For an example of its use in China, see T'ung-chi kung-tso Data Section, "The Productive Activities of Building Construction Enterprise During the Past Four Years," T'ung-chi kung-tso (Statistical Work) pp. 31-32, No. 18, 1957, and for a discussion of its use in the Soviet Union, see Herbert S. Levine, "A Small Problem in the Analysis of Growth," The Review of Economics and Statistics, No. 2, 1960, pp. 225-228.

Why are the results of these two attempts to allocate the increment in output between employment and productivity so different? To make the cause of this difference clear, let us consider the relationship which states that output equals productivity times labor, or algebraically:

$$Q = P \times L$$



where Q represents quantity of output, P represents productivity, and L represents the average number of workers. If during the period under consideration output, productivity, and labor increased by ΔQ, ΔP, and ΔL, respectively, then output at the end of the period would be:

$$Q + \Delta Q = (P + \Delta P)(L + \Delta L)$$

and the increase in output would be:

$$\Delta Q = P \Delta L + L \Delta P + \Delta P \Delta L$$

$P \Delta L$ is the increment in output associated with the increase in labor and $L \Delta P$ is the increment associated with the increase in productivity, while $\Delta L \Delta P$ is the increment associated with the interaction of labor and productivity, or is the joint product of labor and productivity.

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The two attempts to allocate the increase in output between labor and productivity yield different results because the entire joint product was arbitrarily allocated to productivity in the first while it was equally arbitrarily allocated to labor in the second. Although any method of allocating the joint product of labor and productivity is arbitrary, the most satisfactory method is to divide it evenly between labor and productivity.*

Table 4 presents the annual percentage increases in output from 1952 through 1957 and divides these percentage increases into increments due to the growth of labor and due to the growth of productivity. On the average, the increase in labor accounted for 54.4 percent of the increase in output while the increase in productivity accounted for the other 45.6 percent, but the differences from year to year were extreme.

In 1955, because the average number of workers declined labor made a negative contribution to the growth of output which was offset by the growth of productivity. In 1957, because the average number of workers grew faster than output, labor accounted for 113.2 percent of the increase in output and offset the slight decline in productivity. In 1953, 1954 and 1956, the increase in labor accounted for 77.5 percent, 51.4 percent, and 38.4 percent, respectively, of the increase in output.

* This is the procedure developed in Frederick C. Mills Productivity and Economic Progress, New York, 1952.

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Table 4

Allocation of the Annual Percentage Increase in Output
Between Labor and Productivity
1953-1957

	Annual Percentage Increase in Output a/	Allocation of the Increase in Output b/	
		Labor	Productivity
1953-1957, average	16.0	54.4	45.6
1953	20.7	77.5	22.5
1954	14.8	51.4	48.6
1955	5.5	-49.1	149.1
1956	30.2	38.4	61.6
1957	10.2	113.2	-13.2

a. Table 3.

b. Derived from the annual percentage changes in Table 3 by the procedure developed in Frederick C. Mills Productivity and Economic Progress, New York, 1952.

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Indexes of output, labor and productivity by branch of industry are presented in Table 5. The growth in productivity averaged 42.2 percent, but the differences between the rates of growth shown by individual branches of industry are extreme, ranging from only 20.5 percent in the electric power industry to 86.3 percent in the ferrous metals industry.

In the fuels industries, the increases in productivity were the lowest of the ten branches presented in Table 5, but for different reasons. The above-average increase of 141.4 percent in the output of the electric power industry was almost matched by an increase of 100.3 percent in the number of workers employed and productivity increased by only 20.5 percent. In the coal industry the increase in output of 66.7 percent was below average, but the number of workers increased by only 27.0 percent resulting in an increase in productivity of 31.3 percent.

In the branches of industries producing industrial materials -- the ferrous metals, chemical processing, building materials, and paper industries, the increases in productivity, which ranged from 61.5 percent to 86.3 percent, were higher than those for any other group of industries. The increases in output, which ranged from 96.2 percent in the paper industry to 190.0 percent in the ferrous metals industry, were matched by the increases in the electric power, metal

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Table 5

Indexes of Output, Labor, and Productivity
by Branch of Industry
1956

1952 = 100

	Output a/	Labor b/	Productivity c/
All industry	190.4	133.9	142.2
Electric power	241.4	200.3	120.5
Coal	166.7	127.0	131.3
Ferrous metals	290.0	155.7	186.3
Metal processing	228.3	145.8	156.6
Chemical processing	262.2	161.8	162.1
Building materials	223.5	138.4	161.5
Paper	196.2	105.8	185.4
Textiles	163.0	121.2	134.5
Food	156.3	117.6	132.9
Other	201.0	150.2	133.8

a. Table A-1.

b. Table A-2.

c. Derived by dividing the indexes of output by the indexes of labor.

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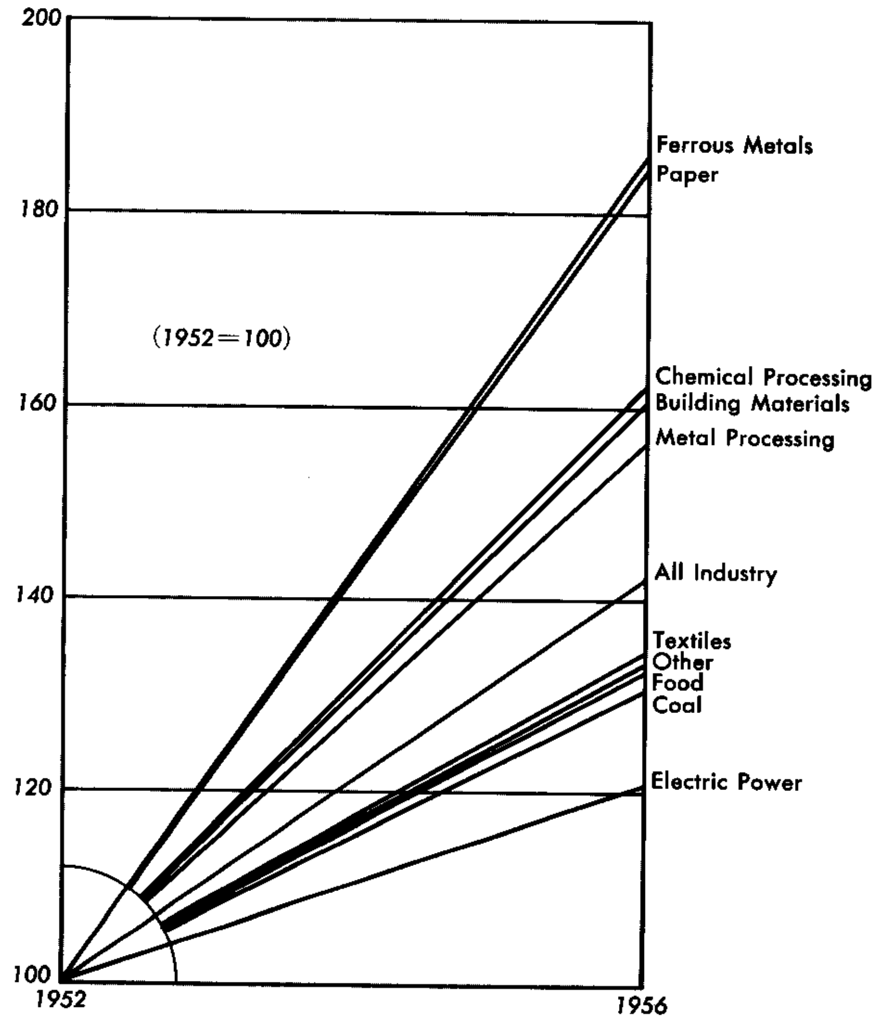
Figure 4

INDEXES OF PRODUCTIVITY BY BRANCH OF INDUSTRY 1956



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processing, and other branches of industry, but the increases in the number of workers were all low in relation to the increases in output. In the metal processing industry, the increase in productivity of 56.6 percent was only slightly lower than in the branches producing industrial materials.

In the branches of industry producing consumer goods, increases in output, labor, and productivity were all below average. In the textile industry, output grew by 63.0 percent, labor by 21.2 percent and productivity by 34.5 percent, while in the food industry output grew by 56.3 percent, labor by 17.6 percent, and productivity by 32.9 percent.

The category of other branches of industry must be treated with caution because the indexes of output and labor may be subject to a wide range of error. Because the index of output was derived in the process of adjusting the aggregate index for coverage, it is influenced by errors in the indexes estimated for the nine specifically included branches of industry, which may be cumulative, and by errors in the data on the gross value of output used in the adjustment process. The index of labor for the other branches of industry, which was derived from the residual number of workers, is probably more reliable than the index of output, but it too may reflect cumulative errors of estimation. Because the index of output per worker was derived from these indexes of output and labor it can only be taken as a general indication of the change in productivity.

Has the shift in the structure of industry had any impact on the growth of productivity? Those branches of industry in which output grew faster than average, such as the ferrous metals or chemical processing industries, have increased their relative importance while those that grew more slowly than average, such as the textile or food processing industries, have decreased in their relative importance, but have these changes affected the rate of growth of productivity? To answer this question we must examine the construction of the index of labor productivity. The formula for the index presented in Table 3 is:

$$\frac{\dfrac{\Sigma V_{56} Q_i}{\Sigma V_{56} Q_{52}}}{\dfrac{\Sigma L_i}{\Sigma L_{52}}}$$

where V represents value added per unit of output, Q represents quantity of output, L represents the average number of workers, and the subscripts 56, 52, and i represent the weight base, the base year and the given year, respectively. Because this index is derived from an aggregative index of output and an aggregative index of employment, it does not assign fixed weights to the indexes of productivity for the various branches of industry. Changes in aggregate productivity are due not only to changes in productivity within the individual branches of industry, but also to changes in their relative importance. But an

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index derived in this manner may be factored into a direct productivity index and an index which shows the impact on productivity of the shift in the structure of industry. The aggregate index of labor productivity may be factored in such a way as to yield a direct index with either value-added or labor weights, and the weights may be for the base year or for the given year. One way in which the index may be factored is:

$$\frac{\sum L_i \dfrac{\dfrac{V_{56}Q_i}{L_i}}{\dfrac{V_{56}Q_{52}}{L_{52}}}}{\sum L_i} \times \frac{\dfrac{\sum V_{56}Q_i}{\sum V_{56}Q_i \dfrac{L_{52}}{V_{56}Q_{52}}}}{\dfrac{\sum V_{56}Q_{52}}{\sum V_{56}Q_{52} \dfrac{L_{52}}{V_{56}Q_{52}}}}$$

The first expression is a direct measure of productivity with given-year labor weights and the second shows the impact of the shift in the structure of industry on the growth of productivity. In particular, the first expression indicates what the growth of productivity would have been if there had been no change in the structure of employment while the second indicates what the growth would have been if there had been no change in the level of productivity within the various branches of industry.*

* The meaning of the second expression may not be immediately obvious because the factoring of the aggregate index yields a weighted harmonic mean rather than a weighted arithmetic mean, but the numerator is the level of productivity which would have prevailed in the given year if there had been no change in productivity within the branches of industry and the denominator is the actual level in the base year.

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The direct productivity index cannot be calculated for years other than 1956 (1952=100) because data on the average number of workers by branch of industry are available only for the years 1952 and 1956, but the index of structural change can be calculated, at least in the form presented here, for each year from 1952 through 1957. The aggregate productivity index, the index of the change in productivity due to structural change, and the direct productivity index derived from them are presented in Table 6. An examination of these indexes shows that the change in the structure of industry had very little effect on the growth of productivity, and that almost all of the increase in productivity was due to changes within the branches of industry.

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Table 6

Indexes of Aggregate Productivity, the Change in Productivity Due to Structural Change, and Direct Productivity
1952-1957

1952 = 100

	1952	1953	1954	1955	1956	1957
Aggregate productivity a/	100.0	104.3	111.5	120.8	142.2	140.3
Change in productivity due to structural change b/	100.0	99.5	99.7	99.8	99.6	99.6
Direct productivity c/	100.0	104.8	111.8	121.0	142.8	140.9

a. Table 3.

b. Calculated from the formula presented in the text. The weights for the index are used for the V_{56}, the index numbers for the Qi and the average number of workers in 1952 for the L_{52}. The weights and index numbers are presented in Table A-1 and the average number of workers in Table A-2.

c. Derived by dividing the index of aggregate productivity by the index of the change in productivity due to the shift in the structure of value-added.

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IV. Factors Contributing to the Growth of Productivity

To measure the growth in the average productivity of labor is to abstract from the change in labor or to measure the impact of all other changes taken together, changes in skill, management, plant size, capital, and the like. Any attempt to explain the growth of productivity, therefore, must take into account the relationships between productivity and these other economic variables.

One of the most important of these variables is the amount of capital available per worker, but the data on capital, as with other important economic series, are not complete and present conceptual difficulties. The Chinese have reported the following data on the value of fixed capital assets at yearend in million yuan:*

	1949	1952	1955	1957
Gross value	12,800	15,800	26,290	35,200
Net value	---	10,140	18,140	---

These figures are not suitable for economic analysis because the figures for the gross value of fixed assets are the "accumulated total" which is valued "at original purchase price,"** and the figures

* The gross value data, except for 1955, are from State Statistical Bureau, Ten Great Years, Peiping, 1960, p. 93; the net value for 1952 was reported by the New China News Agency on October 1, 1957 (see William W. Hollister, China's Gross National Product and Social Accounts, 1950-1957, Glencoe, 1958, p. 62); and both the gross and the net value for 1955 are from T'ung-chi kung-tso, Data Section, "An Abstract of Industrial Capital Throughout China," T'ung-chi kung-tso (Statistical Work), No. 1, 1957, p. 32.

** State Statistical Bureau, Ten Great Years, Peiping, 1960, pp. xxvi and 93.

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for net value are net only in a bookkeeping sense.* These figures, therefore, are neither in current nor constant prices, but in mixed prices, each item of capital equipment being valued in terms of the prices prevailing in the year it was purchased.

Although the objective of this paper is not to make estimates of the capital stock in industry, a rough measure of the net value of fixed capital assets in constant prices was constructed in order to have data on the capital available per worker to explain the growth of productivity. The measure was built on the net value of assets reported for yearend 1952, which was treated as being in constant prices,**

* Because the rate of depreciation is calculated from the formula:

$$\frac{\text{Original Price - Estimated Remaining Value + Estimated Disposal Cost}}{\text{Estimated Number of Years of Life x Original Price}} \times 100$$

the net value of fixed capital assets is simply that portion of the original purchase price which has not yet been written off. See Shanghai Light Industry Bureau, "Regulations Governing the Management of Fixed Assets," Chung-kuo ch'ing kung-yeh (China's Light Industry), No. 4, 1963, p. 20.

** The fixed assets of state-operated enterprises, which accounted for 81 percent of the gross value of all industrial fixed assets according to T'ung-chi kung-tso Data Section, "General Survey of the Socialist Industrialization of China", T'ung-chi kung-tso (Statistical Work), No. 22, 1956, p. 27, were revalued in 1951 and 1952. See T'ung-chi kung-tso Data Section, "An abstract of Industrial Capital Throughout China," T'ung-chi kung-tso (Statistical Work), No. 1, 1957, p. 31.

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and extended to other years on the basis of the reported data on newly-added fixed assets. Because these data are the gross value of additions to capital stock in current prices with no allowance for depreciation,* the data were converted to constant prices and depreciation was assumed to be 5 percent of the gross value of assets.**

This index of the net value of capital in Chinese industry is presented in Table 7. The index shows that the net value of capital increased 131.9 percent during a five year period and that the growth of capital was accelerating during the period, the percentage increase for each year being larger than the increase for the previous year.

But how reliable is this index? Before we can answer this question, we must look at another variable which is closely related to the growth of capital -- the consumption of energy.*** There are, however, problems

* Hupeh University, Kung-yeh t'ung-chi-hsüeh (Industrial Statistics), Wuhan, 1960, p. 254, and Hsü Ch'ien, Tai Shih-kuang, Yü T'ao, et al., Ching-chi T'ung-chi-hsüeh chiang-hua (Lectures on the Study of Economic Statistics), Peiping, 1957, p. 49.

** For the derivation of the series, see Table A-3.

*** A.G. Frank, "Industrial Capital Stocks and Energy Consumption," The Economic Journal, March 1959, pp. 170-174. Frank correlated the growth of energy consumption and the growth of capital stock in industry. With data for American industry covering the period 1880 to 1948, the correlation coefficient was 0.9995; and for British industry between 1865 and 1914, the correlation coefficient was 0.9619 or 0.9893 depending on which measure of industrial capital stock was used.

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Table 7

Net Value of Capital and Net Consumption of Energy in Chinese Industry 1952-1957

	1952	1953	1954	1955	1956	1957
Capital a/						
Million 1952 yuan	9,942	10,844	12,480	14,718	18,124	23,056
Index (1952 = 100)	100.0	109.1	125.5	148.0	182.3	231.9
Net consumption of electric power b/						
Million kilowatt-hours	5,100	6,480	8,220	9,300	12,200	14,902
Index (1952 = 100)	100.0	127.0	161.1	182.4	239.2	292.1
Net consumption of coal c/						
Million metric tons	10.9	---	---	---	---	33.7
Index (1952 = 100)	100.0	---	---	---	---	309.2
Electric power per unit of capital d/						
Kilowatt-hours per thousand 1952 yuan	513	598	659	632	673	646
Index (1952 = 100)	100.0	116.6	128.5	123.2	131.2	125.9
Coal per unit of capital e/						
Metric tons per thousand 1952 yuan	1.10	---	---	---	---	1.46
Index (1952 = 100)	100.0	---	---	---	---	132.7

a. Table A-3.

b. Excludes consumption by electric power stations and transmission losses. See Yuan-li Wu, Economic Development and the Use of Energy Resources in Communist China, New York, 1963, p. 79.

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c. Excludes consumption by coal mines and electric power stations. See I. I. Bazhenov, I. A. Leonenko, and A. K. Kharchenko, Ugol'naya promyshlennost' Kitayskoy Narodnoy Respubliki (The Coal Industry of the Chinese People's Republic), Moscow, 1959, p. 24.

d. Derived by dividing the net consumption of electric power by capital.

e. Derived by dividing the net consumption of coal by capital,

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in using the data on energy consumption as a measure of the services of capital. Two of these problems are (1) that the proportion of energy-using equipment tends to rise as industry expands and (2) that energy tends to be used more efficiently, but these two changes balance each other. For a country like China, where data on capital are fragmentary, the consumption of energy by industrial enterprises may be a better indicator of the services of capital than the data on capital themselves.

The data in Table 7 show that the net consumption of electric power, which increased by 192.1 percent during the First Five-Year Plan, grew significantly faster than capital stock, the consumption of power per unit of capital having grown by 25.9 percent. Power per unit of capital increased 16.6 percent in 1953, a further 10.2 percent in 1954, and then remained fairly constant through 1957. In 1955 and 1957, because the increases in industrial output were below average, the use of power per unit of capital declined slightly, and in 1956 when output increased by 30.2 percent, the consumption of power per unit of capital rose to its highest level. This comparison of the data on the consumption of electric power and the growth of capital suggests that existing capacity was not fully utilized in 1952 but that it was used more intensively as industrial production expanded, reaching a fairly high level during 1954 and fluctuating thereafter with the year to year variations in the rate of growth of industrial production.

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These conclusions are based solely on the consumption of electric power, which represented only about one third of the total amount of energy consumed. If data on the amount of coal consumed per unit of capital were available for years other than 1952 and 1957, the pattern of year to year changes in the consumption of energy might be modified, but the trend for the period as a whole would not be changed and the implication that capacity was used more intensively at the end of the period than at the beginning would still stand, because the amount of coal consumed between 1952 and 1957 increased even faster than the electric power consumed.

In Figure 5, the index of output per worker is plotted against the index of capital per worker. A growth of 40.3 percent in the productivity of labor appears to be reasonable when compared to an increase of 55.1 percent in the amount of capital per worker. But the trend in the capital-labor ratio may not reflect accurately changes in the amount of capital actually used by each worker because the capital-labor ratio is simply the aggregate value of capital stocks divided by the average number of workers employed, and does not reflect changes in the number of shifts worked.

Any change in the number of shifts worked has a direct impact on the amount of capital actually available to those working on any one shift because capital is available for use 24 hours a day whereas labor ordinarily works only one shift. For example, the effective

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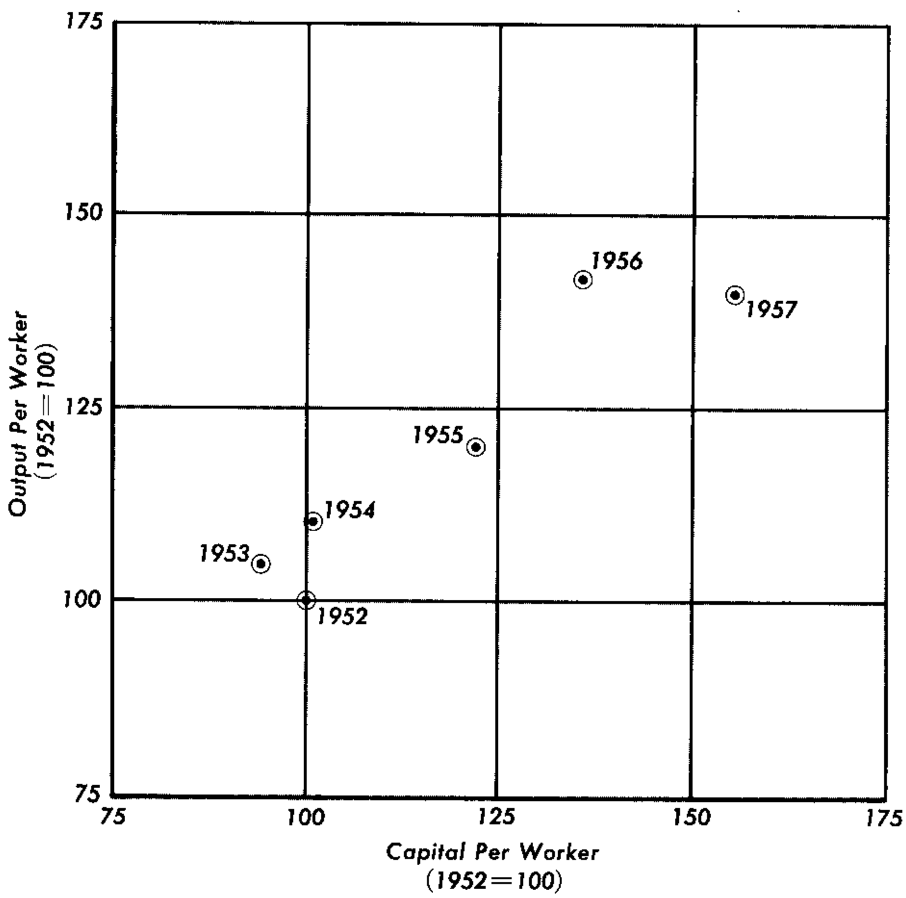
Figure 5

RELATION BETWEEN THE INDEXES OF OUTPUT PER WORKER AND CAPITAL PER WORKER 1952-1957



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value of fixed capital assets per worker would be doubled if industry were to change from operating a single shift to operating two shifts a day. In the absence of data on the distribution of workers among shifts worked or some measure such as the shift coefficient used in the Soviet Union,* the impact of the changes which are bound to have occurred in the number of shifts and in the distribution of persons employed among them cannot be measured. It is likely that the number of shifts increased and that the trend in the capital-labor ratio, therefore, understates the growth in the amount of capital actually available for each person.

A more serious difficulty is that the capital-labor ratio does not reflect the efficiency with which the capital is used, but instead of the capital-labor ratio a more explicit relationship between output, labor and capital may be used. This relationship is as follows: output per unit of labor equals output per unit of capital times capital per unit of labor. Algebraically, the relationship is:

$$\frac{Q}{L} = \frac{Q}{K} \times \frac{K}{L}$$

* The Soviet shift coefficient is the ratio of the total number of workers (not including other employees) to the number of workers in the largest shift. For example, the shift coefficient would be 1.54 if 65 percent of the workers were in the largest shift. The shift coefficient is not affected by the distribution of employment between the second and third shifts.

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Table 8

Indexes of Output per Worker, Output per Unit of Capital
and the Capital-labor Ratio
1952-1957

1952 = 100

	1952	1953	1954	1955	1956	1957
Output per worker	100.0	104.3	111.5	120.8	142.2	140.3
Output per unit of capital	100.0	110.6	110.4	98.8	104.4	90.5
Capital-labor ratio	100.0	94.3	101.0	122.3	136.1	155.1

Sources: Tables 3 and 7.

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where Q represents quantity of output, K represents capital, and L represents the average number of workers.

Table 8 presents indexes of output per worker, output per unit of capital, and the capital-labor ratio. Not only did real capital stocks increase faster than the average number of workers, but after 1953, they increased faster than output. The substantial increases in the productivity of labor, then, were accompanied by a steadily rising capital-labor ratio and decreases in the productivity of capital.

As output increased, the mix of factor inputs changed, and more capital was used per worker in 1957 than had been used in 1952. This change in the mix of inputs was so extreme that the output per unit of capital declined as the output per worker rose, but the relationship between output, labor and capital varied considerably among the various branches of industry. In Table 9, the average annual rates of growth of output per worker are compared with the rates of growth of fixed assets per worker. The data show that, except for the metal processing and the building materials industries, output per worker grew faster than assets per worker, but this is the opposite of the relationship shown by the aggregate data in Table 8 where capital per worker grew faster than output per worker.

The principal difference between the relationship shown in the aggregate data and that shown in the data for the branches of industry is the difference in the nature of the data on capital. The aggregate data are the net value of fixed capital assets in constant prices while the data for the branches of industry are gross rather than net, are valued at original purchase price rather than in constant prices, and

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Table 9

Average Annual Rates of Growth of Output per Worker, Fixed Assets per Worker, and Consumption of Electric Power per Worker, by Branch of Industry During 1953-1956

Percent

	Output per Worker	Fixed Assets per Worker	Consumption of Electric Power per Worker
Electric power	4.8	2.3	---
Coal	7.0	2.5	9.8
Ferrous metals	16.8	8.4	17.5
Metal processing	11.9	13.9	14.6
Chemical processing	12.8	11.0	7.8
Building materials	12.7	14.4	9.2
Paper	16.7	9.0	16.6
Textiles	7.7	2.4	8.1
Food	7.4	2.8	7.8

Sources: Tables 5, A-4, and A-5.

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include only productive fixed assets. The exclusion of nonproductive fixed assets from the data for the branches of industry does not affect the aggregate rates of growth significantly because the proportion of productive fixed assets in all fixed assets remained virtually constant, having been 84.2 percent in 1952 and 83.2 percent in 1957,* although the differences for individual branches of industry may have been greater. Neither does the use of original rather than constant prices have a significant effect because assets were revalued in 1951 and 1952** and because prices did not change significantly during the First Five-Year Plan period.*** The most important difference is that the (1952=100) aggregate data are the net value of capital assets while branch of industry data are the gross value. Because the stock of capital assets

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* State Statistical Bureau, Ten Great Years, Peiping, 1960, p. 93.

** T'ung-chi kung-tso Data Section, "An Abstract of Industrial Capital Throughout China," T'ung-chi kung-tso (Statistical Work) No. 1, 1957, p. 31.

*** The price index for capital assets (with 1952=100) did not rise above 106.5 in 1953 nor fall below 90.4 in 1956 and 1957. See Liu Ta-chung and Yeh Kung-chia, The Economy of the Chinese Mainland: National Income and Economic Development, 1933-1959, Princeton, 1965, p. 235.

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was comparatively old in 1952, 36 percent of its gross value having been written off,* the net additions as a percent of the net value in 1952 were larger than the gross additions as a percent of the gross value in 1952.

Even though the gross value of assets grew significantly more slowly than the net value, the variations in the average annual rates of growth in the gross value of assets are still useful as an explanation of the variation in the rates of growth of productivity. In Figure 6, the average annual rates of growth of output per worker between 1952 and 1956 are plotted against the rates of growth of the gross value of productive fixed assets. When these data are examined, the growth in productivity appears to be reasonable for every branch except the ferrous metals and paper industries which show a growth in productivity much higher than the growth in the value of assets per worker would have led us to expect.

Even though the relationship between the growth of output per worker and the growth in the gross value of assets per worker appears to be reasonable, Table 9 and Figure 6 also present data on the average annual rates of growth in the consumption of electric power per worker. The rates of growth in productivity shown by the chemical processing and building materials industries are slightly higher and the rate shown by the metal processing industry a little lower than the growth in the consumption of electric power would have led us to expect, but the relationship appears to be reasonable.

* See the data on the net and gross value of capital assets in Table A-3.

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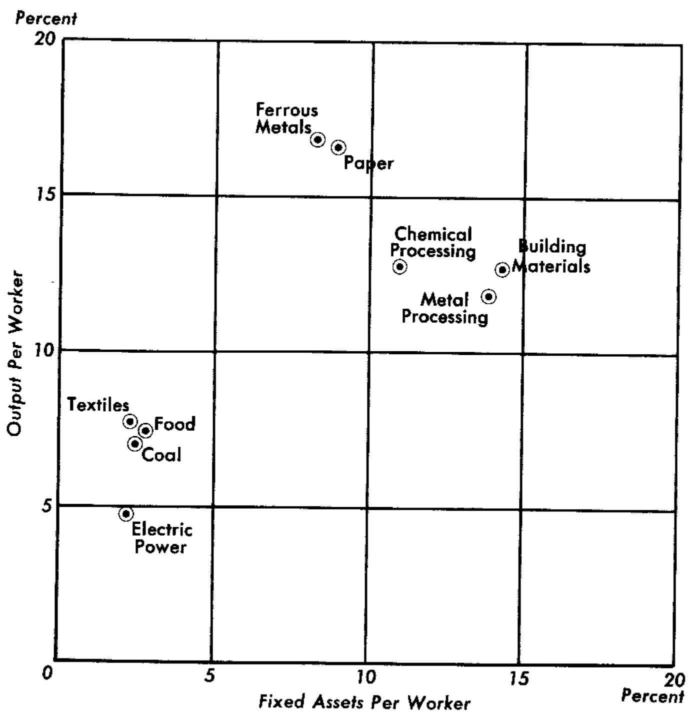
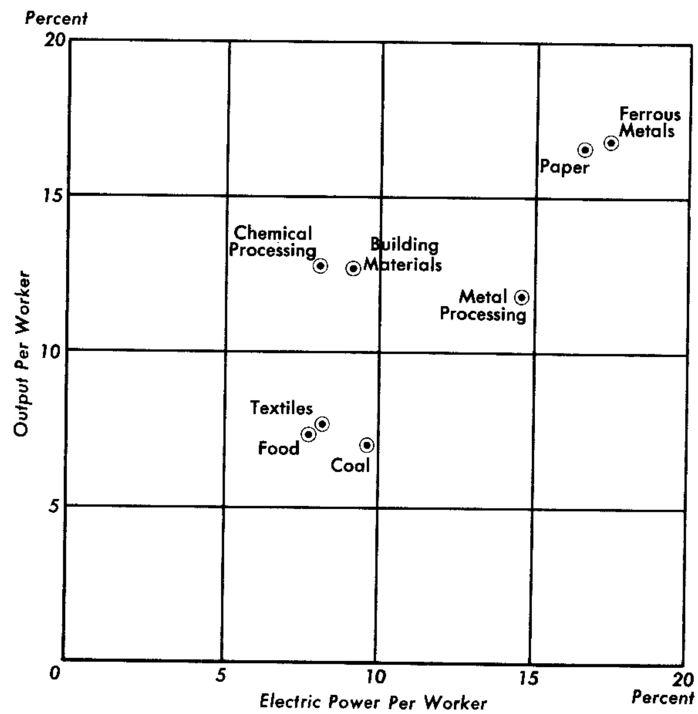
Figure 6

AVERAGE ANNUAL RATES OF GROWTH OF OUTPUT PER WORKER, FIXED ASSETS PER WORKER, AND CONSUMPTION OF ELECTRIC POWER PER WORKER, BY BRANCH OF INDUSTRY DURING 1953-1956





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When the data in Table 9 on assets per worker and the consumption of electric power per worker are compared, the rates of growth in the consumption of electric power were higher than the rates of growth in the value of capital for every branch except the chemical processing and the building materials industries. This difference is due partly to the fact that the data on the gross value of assets understated the true rate of growth, but the pattern of variation in the rates of growth suggests that the difference is also due to the fact that existing capacity was not fully utilized at the beginning of the First Five-Year Plan, especially in the coal, ferrous metals, and paper industries. Let us, therefore, turn to the data on the use of capacity. The percent of capacity not used in 1952 is compared with and plotted against the growth of physical output per worker during the First Five-Year Plan in Table 10 and Figure 7. It can be seen that with the exception of pig iron, the higher the percentage of capacity not used in 1952, the greater the increase in physical output per worker. Because these data are so fragmentary, referring to only seven commodities, any conclusion must be presented with some caution, but the data at least suggest that the employment of capacity not used in 1952 is responsible for some of the growth of productivity, particularly for coal, paper, and steel, and these are commodities produced by branches of industry which showed rates of growth of productivity higher than the growth of assets per worker would have led us to expect.

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Table 10

Indexes of Physical Output per Worker and Capacity per Worker, and the Percent of Capacity Not Used in 1952

	Index (1952 = 100) Physical Output per Worker	Index (1952 = 100) Capacity per Worker a/	Percent of Capacity Not Used in 1952
1956			
Electric power	120.5 b/	98.6	---
Paper	185.4 b/	123.3	44.1 c/
Cotton yarn	126.0 d/	105.6	16.8 d/
Cotton cloth	104.6 d/	---	13.3 d/
1957			
Coal	145.8 e/	130.9	34.9 f/
Pig iron	238.5 e/	235.4	15.6 d/
Steel	192.9 e/	149.5	41.4 d/
Cement	174.3 e/	184.0	22.3 g/

a. Table A-6.

b. Table 5.

c. Derived from data on physical output and capacity reported in State Statistical Bureau, Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chin-hsi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries -- Past and Present), Peiping, 1958, pp. 206 and 209.

d. Ibid., pp. 20 and 169-170.

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e. State Statistical Bureau, Ten Great Years, Peiping, 1960, p. 110.

f. Derived from data on physical output and capacity reported in State Statistical Bureau, "Kuo-min ching-chi t'ung-chi t'i-yao" ("Statistical Abstract of the National Economy"), appended to the pamphlet Kuan-yü 1956 nien-tu kuo-min ching-chi chi-hua chih-hsing chieh-kuo ti kung-pao (Communiqué on Results of Implementation of the 1956 Economic Plan), released August 1, 1957, Peiping, no publication date, pp. 32-33, and T'ung-chi yen chiu Data Section, "The Flying Development of Industrial Construction in China," T'ung-chi yen-chiu (Economic Research), No. 9, 1958, p. 4.

g. Derived from data on physical output and capacity reported in State Statistical Bureau, Ten Great Years, Peiping, 1960, p. 96, and in T'ung-chi yen-chiu Data Section, loc.cit.

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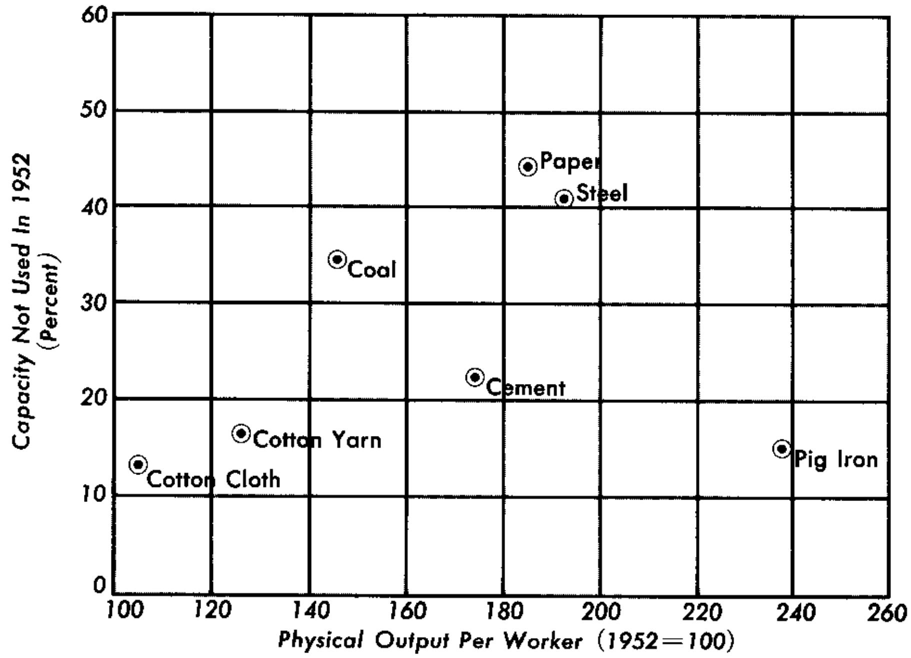
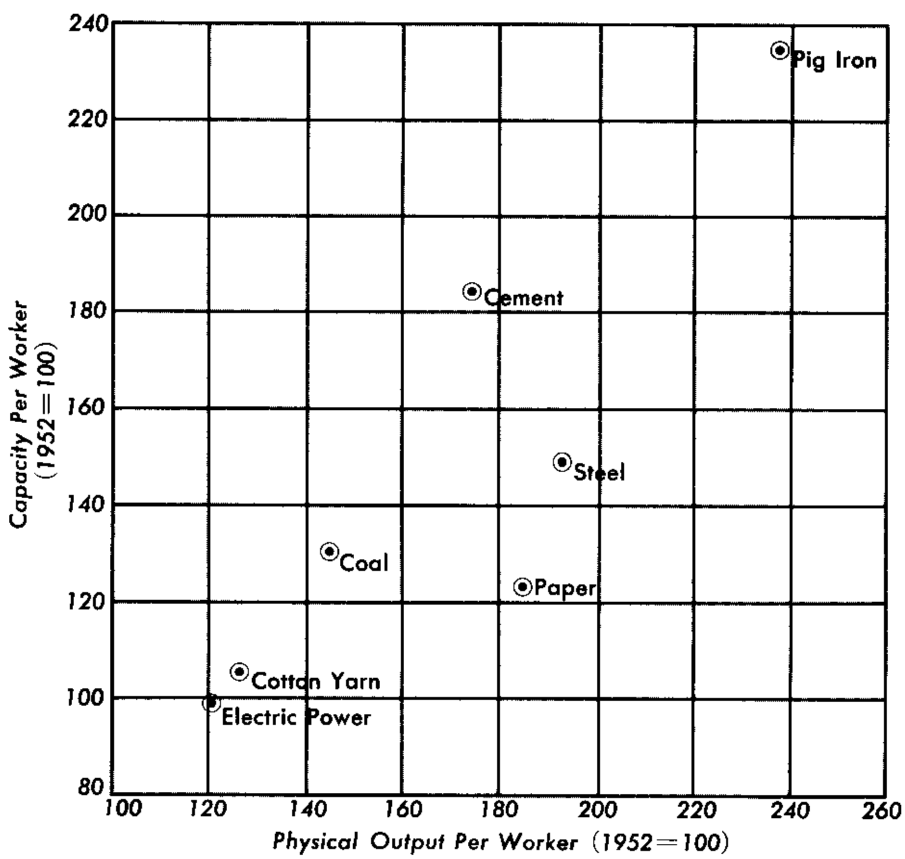
Figure 7

INDEX OF PHYSICAL OUTPUT PER WORKER AND PERCENT OF CAPACITY NOT USED IN 1952 AND INDEX OF PHYSICAL OUTPUT PER WORKER AND CAPACITY PER WORKER





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The increase in the output of pig iron per worker, on the other hand, is a great deal higher than the percent of capacity not used in 1952 would lead us to expect, but only a part of the increases in productivity has come from the more effective use of capacity. Because the growth in capacity per worker has also been an important factor, Table 10 and Figure 7 present data on the growth of capacity per unit of labor. The greater the growth in capacity per worker, the greater the growth in physical output per worker, but this relationship does not conflict with that shown between physical output per worker and capacity per worker. Capacity not used in 1952 and the growth of capacity per worker during the First Five-Year Plan are clearly complementary factors in determining the growth of physical output per worker. Those commodities such as electric power, coal, paper, and steel, which showed a higher percentage of capacity not used in 1952 than the growth in output per worker would have led us to expect all show a lower than expected growth in capacity per worker; and conversely, cement and pig iron which had a less than expected percentage of capacity not used in 1952 had a higher than expected growth of capacity per worker.

But how important was each of these two factors in determining the rate of growth of productivity? One way to answer this question is to examine the relationship which states that output per worker

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equals output per unit of capacity times capacity per unit of labor, or algebraically:

$$\frac{Q}{L} = \frac{Q}{C} \times \frac{C}{L}$$

where Q represents quantity of output, C represents capacity, and L represents the average number of workers. This relationship can be partitioned to show the percent of the increase in productivity due to the increase in output per unit of capacity and the percent of the increase due to the increase in capacity per unit of labor.* The results of this partition are shown in Table 11.

The picture which emerges from the partition is that commodities produced by light industry, such as paper, cotton, yarn, and cotton cloth, enjoyed a very low investment priority and had small increases in capacity per worker, while commodities produced by heavy industry such as coal, pig iron, steel, and cement, had much higher priorities, and with the exception of electric power, greater increases in capacity per worker. The results are that, for light industry, the increase in output per unit of capacity is more important than the increase in capacity per unit of labor and that the growth of productivity was controlled largely by the extent to which capacity

* For a discussion of this type of partition, see p. 30 of this paper.

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Table 11

Allocation of the Percentage Increase in Physical Output per Worker Between Output per Unit of Capacity and Capacity per Worker

	Percentage Increase Over 1952 in Physical Output per Worker a/	Allocation of the Increase in Physical Output per Worker b/	
		Output per Unit of Capacity	Capacity per Worker
1956			
Electric power	20.5	107.6	-7.6
Paper	85.4	65.9	34.1
Cotton yarn	26.0	76.2	23.8
1957			
Coal	45.8	28.6	71.4
Pig iron	138.5	1.6	98.4
Steel	92.9	39.0	61.0
Cement	74.3	-10.1	110.1

a. Table 10.

b. Derived from the data in Table 10 by the procedure developed in Frederick C. Mills, Productivity and Economic Progress, New York, 1952. For a discussion of this type of partition, see p. 30 of this paper.

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was used in 1952. For heavy industry, on the other hand, the increase in capacity per unit of labor was a much more important factor in the growth of output per worker, even for steel for which only 58.6 percent of capacity was used in 1952.

On the strength of the evidence just presented, it may be tentatively concluded that the more efficient use of capacity was an important factor in the growth of productivity. This conclusion is not an attempt to deny that the increase in productivity due to this factor was real. All it indicates is that once the possible productivity gains due to this factor had been made, further increases would have to come from other factors. Hence the trend in productivity during the First Five-Year Plan period would have been difficult to maintain, even without the madness of the "leap forward".

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APPENDIX

STATISTICAL TABLES

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Table A-1

Indexes of Value-Added in Chinese Industry
by Branch of Industry a/
1952-1957

1956 = 100

	Weight	1952	1953	1954	1955	1956	1957
All industry	100.00	52.52	63.40	72.77	76.80	100.00	110.20
Electric power	1.46	41.43	52.96	64.68	72.87	100.00	118.84
Coal	10.63	59.98	62.85	75.46	88.37	100.00	117.29
Ferrous metals	5.16	34.48	46.24	54.93	69.07	100.00	133.28
Metal processing	17.30	43.80	51.14	60.86	62.64	100.00	105.86
Chemical processing	2.50	38.14	47.53	63.11	75.96	100.00	119.33
Building materials	8.51	44.75	60.64	71.95	70.44	100.00	107.30
Paper	1.05	50.98	58.56	71.07	78.79	100.00	125.19
Textiles	18.29	61.36	74.88	85.27	77.85	100.00	94.00
Food	15.50	63.98	78.52	85.28	92.97	100.00	115.83
Other	19.60	49.75	60.66	67.27	74.36	100.00	113.41

a. The details of the construction of this index will be given in my doctoral thesis, The Growth of Production and Productivity in Communist China: 1952-1957. For a description of the methodology, see section III of this paper.

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Table A-2

Average Number of Workers by Branch of Industry
1952 and 1956

Thousand Persons

	1952	1956
All industry a/	3,599.0	4,819.3
Electric power b/	29.7	59.5
Coal b/	318.0	404.0
Ferrous metals b/	134.4	209.2
Metal processing c/	510.0	743.8
Chemical processing c/	72.6	117.5
Building materials c/	275.8	381.8
Paper b/	53.8	56.9
Textiles b/	777.5	942.0
Food d/	732.0	860.6
Other e/	695.2	1,044.0

a. Derived by dividing the gross value of output by the gross value of output per worker. The gross value of output is reported in State Statistical Burea, "Kuo-min ching-chi t'ung-chi t'i-yao" ("Statistical Abstract of the National Economy"), appended to the pamphlet Kuan-yü 1956 nien-tu kuo-min ching-chi chi-hua chih-hsing chieh-kuo ti kung-pao (Communiqué on Results of Implementation of the 1956 Economic Plan), released August 1, 1957, Peiping, no publication date, pp. 28-29; and the gross value of output per worker is reported in Chung-kuo kung-jen (The Chinese Worker), No. 4, 1958, p. 7.

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b. State Statistical Burea, Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh, fang-chih tsao-chih kung-yeh ti chin-hsi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries -- Past and Present), Peiping, 1958, pp. 27, 67, 99, 174, and 211.

c. Derived by dividing the amount of electric power consumed by the amount consumed per worker. These data are reported (ibid.) on pp. 72-73.

d. For 1956, the number of workers was estimated on the assumption that the average number of workers and employees in 1956 was the same as the 1.2 million reported for the end of 1955 in Cheng Ko-huan, "The Significance and Function of the Food Processing Industry in the National Economy," Shih-p'in kung-yeh (Food Processing Industry), No. 1, 1957, p. 7; and on the assumption that the ratio of wage workers to the total number of workers and employees in the food industry was 71.7 percent, the same as the ratio of workers alone to workers and employees in all industry. For 1952, the number of workers was estimated on the assumption that the number of workers in the food industry as a whole grew at the same rate as the number of workers in enterprises for which data on the consumption of electric power are available. The number of workers in these enterprises was derived in the manner described in note 3, above.

e. Residual.

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Table A-3

The Derivation of the Average Net Value
of Fixed Assets in Chinese Industry
1952-1957

	1951	1952	1953	1954	1955	1956	1957
Newly added fixed assets in million current yuan a/	---	1,130	2,340	2,820	3,530	4,900	6,470
Price index b/ (1952=100)	---	100.0	106.5	102.0	96.7	90.4	90.4
Newly added fixed assets in million 1952 yuan c/	---	1,130	2,197	2,765	3,650	5,420	7,157
Gross value of fixed assets at yearend in million 1952 yuan d/	14,670	15,800	17,997	20,762	24,412	29,832	36,989
Depreciation in million 1952 yuan e/	---	734	790	900	1,038	1,221	1,492
Net value of fixed assets at yearend in million 1952 yuan f/	9,744	10,140	11,547	13,412	16,024	20,223	25,888
Average net value of fixed assets g/							
Value in million 1952 yuan	---	9,942	10,844	12,480	14,718	18,124	23,056
Index (1952=100)	---	100.0	109.1	125.5	148.0	182.3	231.9

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a. State Statistical Bureau, Ten Great Years, Peiping, 1960, p. 66.

b. Ta-chung LIU and Kung-chia YEH, The Economy of the Chinese Mainland: National Income and Economic Development, 1933-1959, Princeton, 1965, p. 235.

c. Derived as newly added fixed assets in current yuan divided by the price index.

d. Derived by adding the value of newly added fixed assets to the gross value of fixed assets at Yearend 1952. The gross value of fixed assets at yearend 1952 is reported in State Statistical Bureau, op.cit., p. 93.

e. Estimated to be 5 percent of the gross value of fixed assets at the end of the preceeding year.

f. Derived by subtracting depreciation and adding the value of newly added fixed assets to the net value of fixed assets at yearend 1952. The net value of fixed assets at yearend 1952 was reported by the New China News Agency on October 1, 1957. See William H. Hollister, China's Gross National Product and Social Accounts, 1950-1957, Glencoe, 1958, p. 62.

g. Derived as the mean of the net values of fixed assets at yearend.

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Table A-4

Gross Value of Productive Fixed Assets per Worker,
by Branch of Industry
1952-1956

1952 yuan per worker

	1952	1953	1954	1955	1956
Electric power	---	51,197 a/	58,828 a/	58,196 a/	54,784
Coal a/	5,029	---	---	5,417	---
Ferrous metals a/	9,251	9,241	11,662	13,302	12,781
Metal processing	2,996	3,139	3,538	4,357	5,037
Chemical processing a/	8,120	9,066	9,867	11,114	---
Building materials a/	2,431	2,291	2,531	3,641	---
Paper	5,464	---	---	---	7,712
Textiles	2,856	2,899	3,213	3,452	3,143
Food a/	---	3,373	3,312	3,566	---

a. The data apply to state and joint state-privately operated enterprises only.

Sources: State Statistical Bureau, Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chin-hsi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries -- Past and Present), Peiping, 1958, pp. 18, 119, 161, 206, and 211.

Ma Yin-Chu, "A New Theory of Population," Jen-min jih-pao, July 5, 1957.

T'ung-chi kung-tso Data Section, "The Technical Level of China's Industrial Production," T'ung-chi kung-tso (Statistical Work), No. 8, 1957, p. 30.

Hsueh-hsi (Study), No. 7, 1958, p. 26.

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Table A-5

Consumption of Electric Power per Worker
by Branch of Industry
1952 and 1956

	Kilowatt-hours per worker	
	1952	1956
Coal	2,577	3,747
Ferrous metals	4,174	7,968
Metal processing	751	1,296
Chemical processing	5,665	7,649
Building materials	1,113	1,582
Paper	6,188	11,428
Textiles	1,681	2,299
Food a/	839	1,135

a. The data apply only to those enterprises for which information on the consumption of electric power are available.

Source: State Statistical Bureau, Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chin-hsi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries -- Past and Present), Peiping, 1958, p. 73.

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Table A-6

The Derivation of Indexes of Capacity per Worker

	Index (1952 - 100)				
	Physical Output	Physical Output per Worker a/	Average Number of Workers b/	Capacity	Capacity per Worker c/
1956					
Electric power	214.4 d/	120.5	200.3 d/	197.5 e/	98.6
Paper	196.2 d/	185.4	105.8 d/	130.4 e/	123.3
Cotton yarn	145.0 f/	126.0	115.1	121.6 f/	105.6
Cotton cloth	150.0 f/	104.6	143.4	---	---
1957					
Coal	195.5 g/	145.8	134.1	175.6 h/	130.9
Pig iron	311.7 i/	238.5	130.7	307.7 h/	235.4
Steel	396.6 j/	192.9	205.6	307.3 h/	149.5
Cement	239.9 j/	174.3	137.6	253.2 h/	184.0

a. Table 10.

b. Derived by dividing the index physical output by the index of physical output per worker, except as noted.

c. Derived by dividing the index of capacity by the index of the average number of workers.

d. Table 5.

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e. Derived from data on capacity reported in State Statistical Bureau, Wo-kuo kang-t'ieh tien-li mei-t'an chi-hsieh fang-chih tsao-chih kung-yeh ti chin-hsi (Chinese Iron and Steel, Electric Power, Coal, Machinery, Textile, and Paper Industries -- Past and Present), Peiping, 1958, pp. 56 and 206.

f. Ibid., pp. 162 and 177.

g. Table A-1.

h. T'ung-chi yen-chiu Data Section, "The Flying Development of Industrial Construction in China," T'ung-chi yen-chiu (Economic Research), No. 9, 1958, p. 4.

i. State Statistical Bureau, op.cit., p. 30, and Liu Ch'uang, Pai Li-ch'ang, and Wang Yu-chuang, "Chinese Iron and Steel Production Can Overtake Great Britain in 15 Years," Ta-kung pao (Impartial Daily), March 2, 1958.

j. State Statistical Bureau, Ten Great Years, Peiping, 1960, pp. 95-96.

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